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1 June 2001

Mr. Lonnie Monaco, Remedial Project Manager
Code 1822 AC
Engineering Field Activity Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113-2090

RE: Revised Final Letter Work Plan for Ground-Water and Soil Investigation at Site 7,
Naval Air Station, Brunswick, Maine
EA Project No. 29600.47

Dear Mr. Monaco:

EA Engineering, Science, and Technology is pleased to submit two copies of this revised final Letter Work Plan summarizing a ground-water and soil investigation at Site 7. This Work Plan builds upon the previously issued Technical Evaluation for Site 7 outlining the site history (EA 2000[1]). The goal of the activities detailed in this revised final Letter Work Plan is to complete a pumping test and other investigations at Site 7 to assess the degree of impacted ground water at this site. Due to the apparently small area of impacted ground water, it is likely that a No Further Action Record of Decision can be achieved at Site 7. Figure 1 provides the location of Site 7, and Figure 2 provides the layout of Site 7.

This revised final Letter Work Plan outlines a phased approach at the site. Phase 1, completed in December 2000, included a short duration pumping test at Site 7 during which ground-water samples were collected to determine if cadmium concentrations were changing with time. Phase 2 will include installation of temporary sampling points, a limited soil excavation to assess whether a continuing source of cadmium is present in soil, and limited onsite soil screening using an x-ray fluorescence (XRF) scanner instrument.

## DESCRIPTION OF PROBLEM

The impacted ground water at Site 7 may be the result of local geochemical conditions (i.e., elevated total organic carbon and/or bicarbonate). The volume and extent of impacted ground water is not known and, therefore, a short duration pumping test was completed to assess the size of the cadmium plume and establish hydraulic conductivity of the upper sand unit. Data collected during the pumping test were used to assess the size of the impacted area, and determine if ground-water extraction changed cadmium concentrations. If cadmium

1. EA Engineering, Science, and Technology. 2000. Revised Technical Evaluation of Site 7, Naval Air Station, Brunswick, Maine. Submitted to Northern Division and NAS Brunswick. 28 August.

concentrations changed during the pumping test, the data would be used to determine whether this ground-water impact may be limited in nature, or whether ground-water impacts require additional measures.

## PHASE 1—SHORT DURATION PUMPING TEST

Note that Phase 1 was completed in December 2000. To determine the extent of impacted ground water at Site 7, the short duration pumping test was completed as follows:

- Ground-water elevations were monitored using pressure transducers at the pumping well (MW-NASB-094) and the two closest monitoring wells (MW-NASB-229 and MW-NASB-228). Manual gauging of water elevations was completed at the remaining monitoring wells at Site 7 (MW-NASB-095, MW-NASB-092, MW-NASB-093, MW-NASB-096, and MW-NASB-091).

- A 2-in. submersible pump was installed at MW-NASB-094. A short duration step drawdown test was completed to establish the sustainable ground-water yield of the well.

- The step drawdown test was run for a maximum of 4 hours. At a minimum, 3 flow rates were tested to determine the sustainable yield of the pumping well. It was anticipated that the flow rates for the step drawdown test would be between 1 and 5 gpm, although the actual flow rates were dependent upon site conditions.

- Following the step drawdown test, the aquifer was allowed to equilibrate to at least 90 percent of initial water elevations (i.e., the head difference was 10 percent or less compared to pre-test water elevations).

- Following equilibration, the pumping test was initiated at the highest sustainable flow rate. The pumping test continued for up to 48 hours. The flow rate was adjusted, as necessary, to prevent dewatering of the well. Extracted ground water was containerized prior to disposal via the sanitary sewer. Ground-water discharge to the sanitary sewer was coordinated with the Brunswick Sewer District.

- During the pumping test, 5 ground-water samples were collected from the pumping well (MW-NASB-094) to determine cadmium concentration trends with time. Ground-water samples were collected according to the following schedule: 1 baseline sample was collected within the first hour prior to starting the test, 2 samples were collected during the test at approximately 18-hour intervals, 1 sample was collected at the end of the test immediately prior to test cessation, and 1 sample was collected following aquifer recovery approximately 24 hours after the conclusion of the test. Table 1 summarizes the analytical sampling protocol for this investigation.

- Ground-water samples were analyzed for cadmium by U.S. Environmental Protection Agency Method 6010, total organic carbon by Method 415.1, and bicarbonate. Field parameters measured included pH, oxidation-reduction potential, temperature, turbidity, and conductivity. Samples were analyzed for 48-hour turnaround time to permit rapid decision-making.

- Following completion of the pumping test, ground-water sample results were assessed to determine if cadmium concentrations have been reduced, and whether changes in ground-water geochemical analytes (i.e., total organic carbon and bicarbonate) may be related to any observed changes in cadmium concentrations with time.

- The hydraulic conductivity of the overburden aquifer will be calculated based on data collected during the pumping test and presented in the letter report for this Work Plan. These data will be used to assist in interpretation of cadmium concentration data collected from laboratory analytical sampling.

## PHASE 2—INSTALLATION OF TEMPORARY SAMPLING POINTS AND EXCAVATIONS

The concentrations of cadmium remained constant or increased during the pumping test, therefore, additional investigations will be completed to assess whether a source of cadmium is present in soil. The source of cadmium impacts, if present, could be relatively small in size and may contain limited concentrations. It is possible that no man-made source exists, and cadmium concentrations in ground water may be related to natural site ground-water chemistry in the area around MW-NASB-094, or a limited organic-rich interval near this well.

To collect data related to potential sources of cadmium in soil, the following step-by-step process will be completed to determine the extent of cadmium impacts in ground water, and to determine whether a source of cadmium may exist in soil.

### Step 1 – Installation of Temporary Sampling Points

- Install, develop, and sample a total of 4 temporary sampling points approximately 10, 20, and 40 ft downgradient of MW-NASB-229 (identified as Temp-01, Temp-02, and Temp-03, respectively) and one upgradient temporary sampling point approximately 35 ft west of MW-NASB-094. Water elevation data collected on 21 May 2001 were used to determine ground-water flow patterns at the site, and the location of the temporary monitoring points (Temp-01, Temp-02, and Temp-03) are in the inferred downgradient direction from MW-NASB-229. Table 2 summarizes and presents the water gauging data. Figure 3 presents ground-water flow patterns at Site 7, and the approximate locations of temporary sampling points. The temporary sampling points would have a screen interval identical to that of MW-NASB-229 (i.e., screened above the clay layer).

- One sample will be collected from 4 temporary sampling points (Temp-01 through Temp-04) for cadmium, total organic carbon, and bicarbonate[2]. Table 1 summarizes the analytical sampling protocol for this investigation.

- The cadmium concentrations detected at the temporary sampling points will be used to define the limit of the cadmium impacts in this area.

- The ground-water sampling results of these temporary sampling points will be reviewed to establish the extent of ground-water impact and the area that may contain a potential soil source. Following receipt and review of the analytical data collected at the temporary sampling points, a determination will be made as to the following course of action:

  — If cadmium is below 5 µg/L, the extent of cadmium impacted ground water can be inferred to be immediately around and upgradient of MW-NASB-094 and MW-NASB-229. Excavation (described in Step 2) will be completed in this area to identify or remove the source area, if present.

  — If cadmium is above 5 µg/L, excavation is recommended (described in Step 2) to identify or remove the source area, if present. Based on the findings of the temporary ground-water sampling points, an additional sampling point may be necessary to identify the extent of the ground-water plume, or to monitor the effect of the soil removal, if needed.

**Step 2 – Complete Excavation and Visual Survey**

This will include excavations and visual survey of subsurface soils in the area of MW-NASB-094. This portion of Site 7 is considered the most likely location of a source area.

The excavation will include the following:

- A backhoe will be used to excavate the area immediately upgradient (i.e., west and northwest) of monitoring well MW-NASB-094. The excavation will continue to the depth of the clay layer (approximately 12 ft below ground surface). Depending on site conditions (i.e., soil stability, water table depth), the excavation may require benching to reach the top of the clay layer. Dewatering of the excavation is anticipated to be required to permit the visual survey, and to achieve the target depth of 12 ft below ground surface. Ground water removed will be discharged to the Brunswick Sewer District via temporary hoses, or temporarily stored onsite prior to discharge, if necessary, to reduce turbidity.

2. Elevated concentrations of total organic carbon and bicarbonate may increase naturally occurring concentrations of cadmium in ground water. Data collected from Site 7 monitoring wells summarized in the Remedial Investigation Report and literature values will be used to assess whether ground water monitored by these sampling points has elevated concentrations of these analytes.

- The purpose of the excavation is to visually identify any possible source that may be contributing to ground-water impacts. A Maine geologist will visually survey the soil as it is removed from the excavation in an attempt to identify debris, containers, organic-rich intervals, or other potential source material that may contain cadmium. If possible source intervals are encountered, the excavation will focus on removing those intervals. This may include excavation of existing monitoring wells MW-NASB-094 and/or MW-NASB-229 if the screened intervals intersect a possible source area.

- An onsite XRF scanner will be used to characterize cadmium concentrations in soil during the excavation. The anticipated detection limit of the XRF for cadmium (10 mg/Kg) is above the minimum soil concentration that would account for observed concentrations in ground water. Despite this limitation, use of the XRF will be completed to provide real-time quantitative data needed to assess soil cadmium concentrations. In addition, results from this instrument will provide quantitative screening data that may be used to assess and map subsurface cadmium source extents (if encountered).

- Based on visual observations and results of XRF scanning, soil will be stockpiled or placed on plastic sheeting for offsite disposal.

- Soil disposal options will be dependent on XRF sampling results and a visual scan as follows:

  — Non-detection of cadmium (i.e., soil below XRF detection limit anticipated to be 10 mg/Kg) without a potential cadmium source based on the visual scan will be placed back into the excavation.

  — If cadmium is detected below the State of Maine Department of Environmental Protection Residential Guideline of 27 mg/Kg, or if the visual survey indicates a potential source, excavated soil will be segregated and stockpiled on plastic sheeting. This soil represents a potential source of the ground-water impact at Site 7, but does not require offsite disposal. The soil could be re-used onsite, but will not be returned to the excavation or placed at a depth that will be below the water table. This material shall be replaced with clean backfill in the excavation.

  — If cadmium is detected above the State of Maine Department of Environmental Protection Residential Guideline of 27 mg/Kg, or if the visual survey indicates a likely source (i.e., stained soil, or other industrial source), excavated soil will be segregated and removed from the site. This soil would represent a likely source of the ground-water impact at Site 7.

  — Note that the federal standard for cadmium in soil is 1,400 mg/kg (EPA Region IX Preliminary Remediation Goals) or 37 mg/kg for cancer risk. The MEDEP standard is more stringent and, therefore, will be used as the soil screening value.

- If more soil is needed for backfill, clean soil from offsite will be used. Prior to backfilling the excavation, a fabric marker (geotextile) will be placed in the excavation to note the extent of the investigation.

- Approximately 1-2 weeks following the test pit excavation, 1 permanent monitoring well will be installed downgradient of the excavated area to assess whether the pumping test and soil excavation efforts were successful in removal of the source of cadmium in ground water. Four weeks following well development, 1 ground-water sample will be collected from this well to be analyzed for cadmium, total organic carbon, and bicarbonate. Field parameters to be measured will include pH, oxidation-reduction potential, temperature, turbidity, and conductivity.

**Step 3 – Evaluation of Results**

The data collected during the pumping test, ground-water sampling, and soil screening with XRF and visual observations will be interpreted. A brief letter report will be issued summarizing the results of these activities. Any potentially contaminated soil or potential source area soil will not be removed from the site until after the Navy has reviewed the letter report and given the approval for the disposal method. Discussions will be held with the Technical Subcommittee of the Brunswick Restoration Advisory Board to determine appropriate actions based on data collected during this investigation.

**Step 4 – Goals**

At the completion of this investigation, a letter report will be generated summarizing the results of the tasks completed and data collected as described in this Work Plan. It is anticipated that the letter report will be able to serve as a close-out report for Site 7, or modified to include required items for a close-out report.

If the analytical results of the ground-water sample collected from the new monitoring well are below 5 µg/L, along with the successful identification and removal of a likely soil source area, the Navy believes they will be able to receive Maine Department of Environmental Protection concurrence for a No Further Action (NFA) at Site 7. Based upon the investigation data and other previously collected data, it may be necessary for the Navy to prepare an NFA Record of Decision (ROD) for the soils and an NFA with monitoring ROD for ground water at Site 7. If the data support an NFA for both soil and ground water, an NFA ROD will be generated for Site 7.

The Navy's goal is to have an NFA ROD for both soil and ground water, or an NFA ROD for soils and an NFA with monitoring ROD for ground water for Site 7 early in the year 2002. We expect to achieve this goal by completing the tasks in this revised final Letter Work Plan as well as the data gathered during the previously collected site data, and we look forward to continuing to work closely with the Technical Subcommittee members.

If you require additional information or clarification on this investigation at Site 7, please do not hesitate to contact me.

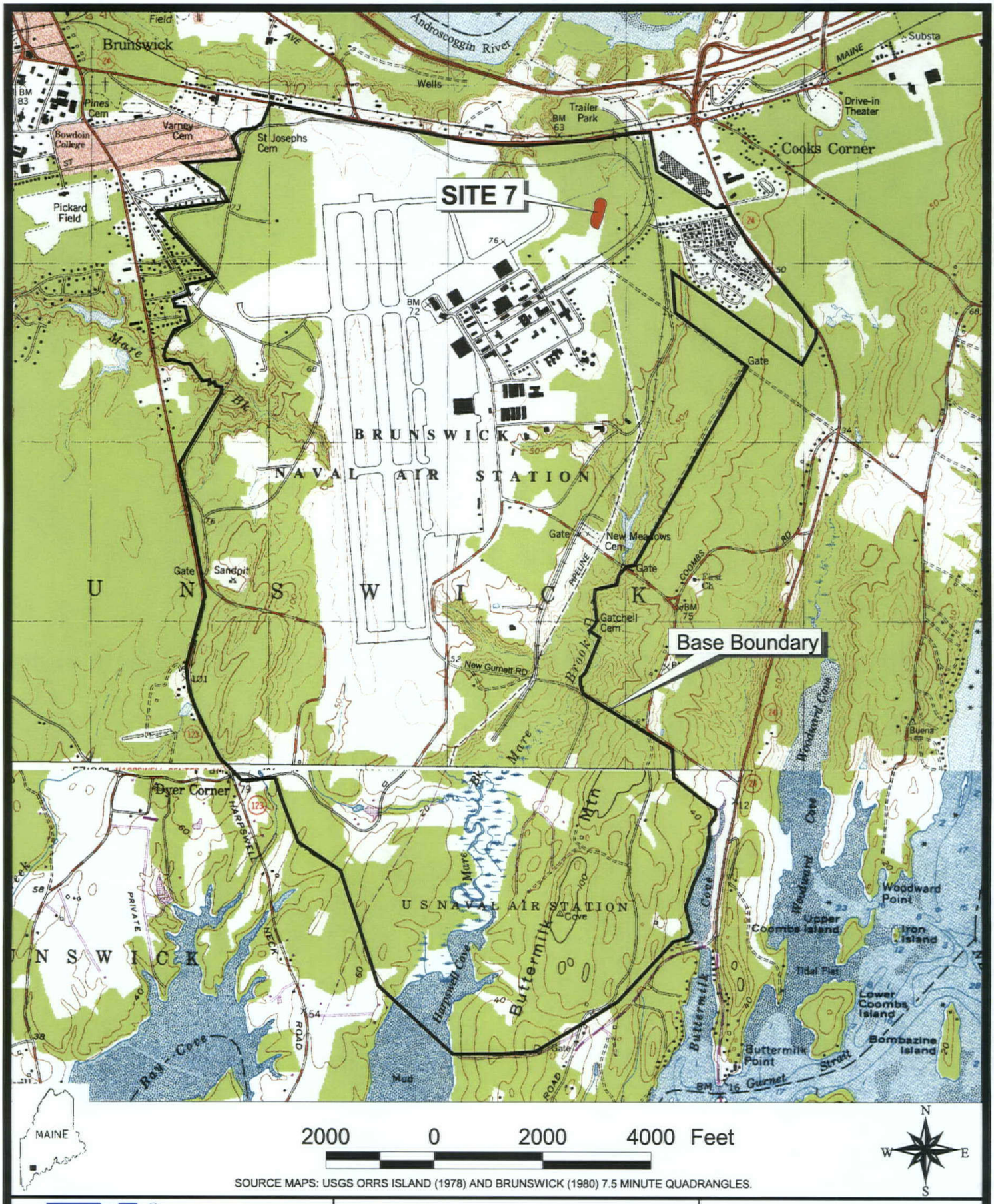
Sincerely,

Alexander Easterday

Alexander C. Easterday, P.G.
CTO Manager

ACE/caw

cc: M. Fohner (EFANE)
M. Barry (EPA)
C. Sait (MEDEP)
C. Lepage (Lepage Environmental)
T. Williams (NAS Brunswick)
S. Chase (EA Brunswick)
P. Nimmer (EA Newburgh)




SOURCE MAPS: USGS ORRS ISLAND (1978) AND BRUNSWICK (1980) 7.5 MINUTE QUADRANGLES.

| EA ENGINEERING, SCIENCE, AND TECHNOLOGY | SITE 7<br>NAVAL AIR STATION, BRUNSWICK, MAINE | FIGURE 1<br>SITE LOCATION MAP |
|---|---|---|

| PROJECT MGR | DESIGNED BY | DRAWN BY | CHECKED BY | SCALE | DATE | PROJECT No | FILE No |
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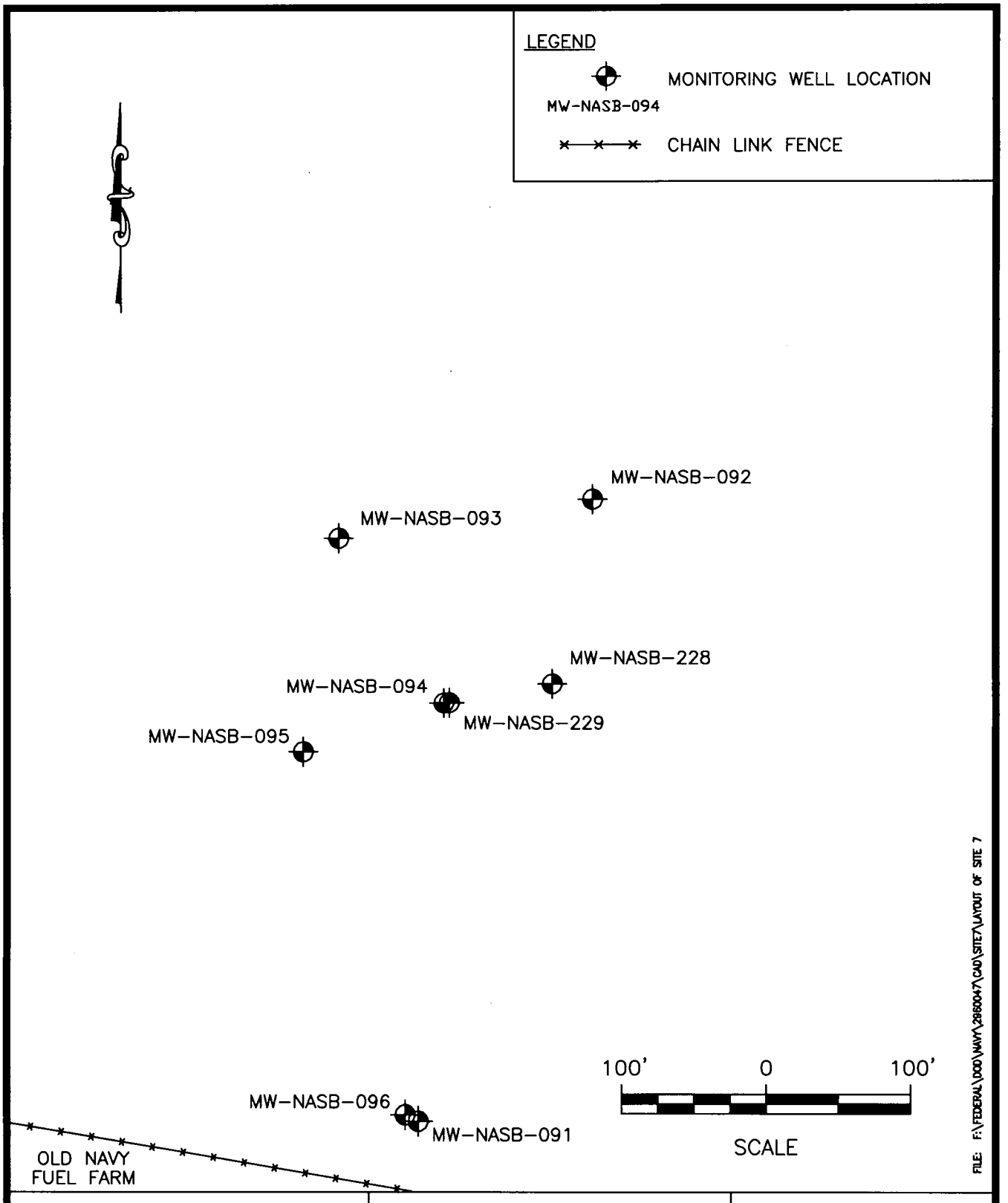
| ACE | BT | BT | ACE | AS SHOWN | 20 OCT. 2000 | 29600.47 | I:\NASB_GIS\NAVY.APR |

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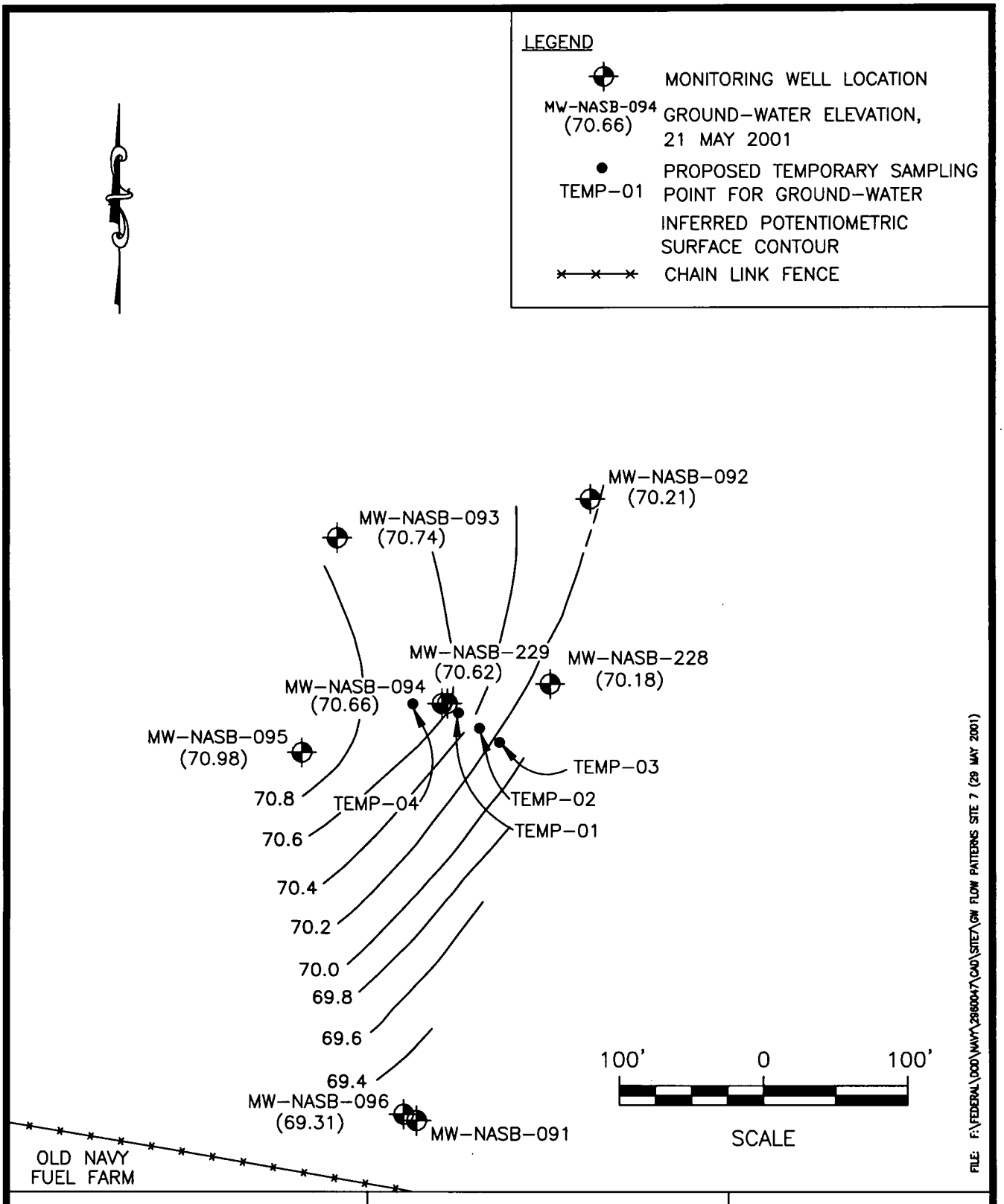
SITE 7
NAVAL AIR STATION
BRUNSWICK, MAINE

FIGURE 2
LAYOUT OF SITE 7

| PROJECT MGR | DESIGNED BY | DRAWN BY | CHECKED BY | SCALE | DATE | PROJECT NO | FILE No. |
|---|---|---|---|---|---|---|---|
| ACE | PLN | JG | PLN | AS SHOWN | 13 OCT 2000 | 29600.47 | SITE7LAYOUT |

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SITE 7
NAVAL AIR STATION
BRUNSWICK, MAINE

FIGURE 3
GROUND-WATER FLOW PATTERNS AT SITE 7
21 MAY 2001

| PROJECT MGR | DESIGNED BY | DRAWN BY | CHECKED BY | SCALE | DATE | PROJECT NO | FILE No. |
|---|---|---|---|---|---|---|---|
| ACE | PLN | SAP | PLN | AS SHOWN | 29 MAY 2001 | 29600.47 | GWFLOW |

TABLE 1 SUMMARY OF SAMPLE PARAMETERS, ANALYTICAL PROCEDURES, PRESERVATION, HOLDING TIME, AND CONTAINERS FOR GROUND-WATER SAMPLES

| Analyte | Method | Sample Holding Time | Sample Preservation | Number and Type of Containers |
|---|---|---|---|---|
| Cadmium | U.S. Environmental Protection Agency 6010 | 6 months, 28 days for mercury | $HNO_3$, cool to 4°C | 1 × 1-L Nalgene bottle |
| Total Organic Carbon | 415.1 | 28 days | H2SO4, cool to 4°C | 1 × 125-ml glass bottle |
| Bicarbonate | Calculation from alkalinity (310.1) | 14 day | Unpreserved, cool to 4°C | 1 × 500-ml plastic bottle |

NOTE: Total organic carbon and bicarbonate results will be submitted for 2-week laboratory turnaround time.
Data packages will be quality control Level II.
Quality control samples will include 1 duplicate sample and 1 rinsate sample collected from decontaminated sample apparatus (low-flow sampling pump).

TABLE 2 MONITORING WELL GAUGING SUMMARY
SITE 7, NAVAL AIR STATION BRUNSWICK, MAINE
21 MAY 2001

| Well Designation | Well Riser Elevation (ft MSL) | Depth to Well Bottom (ft below TOC) | Depth to Water (ft below TOC) | Water Table Elevation (ft MSL) |
|---|---|---|---|---|
| MW-NASB-091 | 76.08 | 20.54 | 13.15 | 62.93 |
| MW-NASB-092 | 77.02 | 14.35 | 6.81 | 70.21 |
| MW-NASB-093 | 77.45 | 18.95 | 6.71 | 70.74 |
| MW-NASB-094 | 77.18 | 12.40 | 6.52 | 70.66 |
| MW-NASB-095 | 78.87 | 16.88 | 7.89 | 70.98 |
| MW-NASB-096 | 73.36 | 11.00 | 4.05 | 69.31 |
| MW-NASB-228 | 75.65 | 9.98 | 5.47 | 70.18 |
| MW-NASB-229 | 77.04 | 12.7 | 6.42 | 70.62 |

NOTE: MSL = Mean sea level.
TOC = Top of casing.